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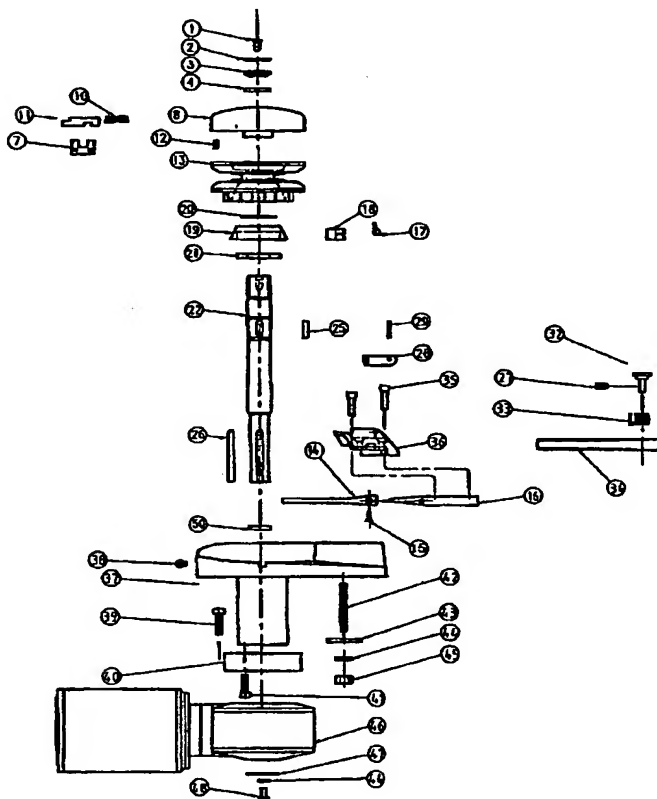
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(54) Title: FREE FALL WINDLASSES



(57) Abstract: A winch which is provided with means to automatically provide free fall of an anchor, said winch including means to drive the anchor's attached rope/chain out of a storage area until the weight of the anchor and attached rope/chain is sufficient to activate a means to disengage the drive mechanism and the anchor is permitted to free fall; the winch also has means to provide controlled motorised lowering and braking of the falling anchor at any time during its downwards fall but which may be used as a conventional power up power down winch.

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FREE FALL WINDLASSES

Technical area

This invention relates to the area of rope/chain anchor winch/windlasses and in particular to an anchor winch/windlass which can be used in a manner which permits free fall as well as controlled lowering and which can also be used as a conventional winch/windlass.

Background to the invention

For the purpose of the following discussion the words winches/ windlasses will be referred to for simplicity as winches.

Automatic winches are particularly suitable for use as anchor winches as when the anchor is being lowered the weight of the anchor can permit free falling of the rope or chain through the anchor winch. This is particularly useful in deep water anchoring. Preferably where anchoring is to take place in shallow water it is desirable that the anchor be lowered under the control of a motor.

A problem associated with trying to use anchor winches in free fall mode is that, if a boat has a deep chain locker, the weight of the chain hanging into the chain locker below the anchor winch can be greater than the weight of the anchor. Therefore the anchor cannot initially free fall despite an anchor winch being in free fall mode. The

anchor will only free fall when the combined weight of the anchor and chain hanging over the bow roller is greater than that of the chain hanging down into the chain locker.

Winches are known which are capable of operating in free fall mode however none of these are capable of effectively stopping or braking during free fall without causing damage to equipment. In addition winches to date have not been able to operate as conventional power up power down winches while having a free fall capacity.

Outline of the Invention

It is an object of this invention to provide a winch which helps to avoid the above described problems by providing a winch having means such that when it is initially driven in reverse, the anchor rope/chain is fed out until the weight of the anchor and rope/chain combination is sufficient to trigger means to permit free fall of the anchor but which winch can also permit controlled motorised lowering and braking of the falling anchor in any position during its downward fall. It is a further object of the invention that the winch be able to be used as a conventional winch when required.

The invention is a winch which is provided with means to automatically provide free fall of an anchor, said winch including means to drive the anchor's attached rope/chain out of a storage area until the weight of the anchor and attached rope/chain is sufficient to activate a means to disengage the drive mechanism and the anchor is permitted to free fall; the winch also has means to provide controlled motorised lowering and braking of

the falling anchor at any time during its downwards fall but which may be used as a conventional power up power down winch.

It is preferred that the conversion to a conventional winch be effected by disengaging a clutching and declutching pawl.

It is further preferred that the winch be able to be controlled remotely or at the winch itself.

It is preferred also that the winch of the invention is fitted with a rope/chain gypsy allowing it to use all rope, all chain or a rope/chain combination. The requirements of this anchor winch are that when lifting the anchor the gypsy must be driven with little or no loss of drive between the main shaft and the gypsy. It must permit quick and easy free fall of the anchor when required.

In order that the invention may be more readily understood we shall describe by way of non limiting example one specific embodiment thereof with reference to the accompanying drawings.

Description of the drawing figures

Fig.1 shows the winch in elevation and partly in section

Fig.2 is an exploded diagram of the winch components

As shown in Figure 1 the invention provides an anchor winch 100 having a clutching declutching pawl 24 such that the anchor winch can be used as a conventional winch by disengaging the clutching/declutching pawl (the pawl).

The anchor winch 100 of the invention includes a base 19 which is coupled to a gearbox, planetary box, or a worm and worm wheel drive. An electric or hydraulic motor can power the gear drive and the radial movement is transferred from the motor to the gear drive.

The main shaft 17 is fitted to a base plate 1 which has an internal bearing to locate the main shaft 17 which is keyed 18 to the gear drive giving a positive drive. The drive from the main shaft is transferred to a rope/chain gypsy 10 via a clutch cone drive 12. The clutch cone drive 12 has an internal bore and an internal keyway and is fitted onto the main shaft 17 with a key fitted between the clutch cone and the main shaft. The clutch cone is held in position on the main shaft by two circlips 11, 13.

The outside diameter of the clutch cone 12 is tapered 25 degrees while the underside of the gypsy 10 has a section bored to the same angle and diameter as the clutch cone to allow the gypsy to sit over the clutch cone and have the best drive possible.

The gypsy 10 which sits over the main shaft 17 and on the clutch cone 12 is bored 0.15mm larger than the main shaft to allow it to rotate freely on the main shaft. The gypsy has no positive drive between itself, the clutch cone or the main shaft.

Located above the gypsy is a PVC clutch nut washer 9 which is used to assist in the engaging and disengaging of the clutch nut 8.

The clutch nut 8 is fitted to the main shaft 17 and when the main shaft is driven in the lifting direction the clutch nut 8 is held in position by a spring 4 and loaded plunger pin 5 against a pawl 24 which is mounted on to the anchor winch chain cover/pawl housing 23. This allows the clutch nut to be driven down the main shaft until it tightens against the PVC clutch nut washer and the clutch cone forcing the gypsy to rotate in the same direction as the main shaft. This rotation pulls the rope or chain through the gypsy lifting the anchor.

When the main shaft is driven in the opposite direction the plunger pin 5 holds itself against the pawl 24 which forces the clutch nut 8 to loosen and be driven back up the main shaft releasing the gypsy which will now permit free fall. A clutch nut retaining washer 2 is bolted to the top of the main shaft so that when the clutch nut 8 is in free fall mode it will not screw itself off the main shaft. If the pawl 24 is disengaged the anchor winch will operate as a conventional anchor winch.

The plunger pin 5 which is fitted to the outer diameter of the clutch nut 8 holds the clutch nut against the pawl 24 so that when the main shaft 17 is rotated in either direction the clutch nut is driven up or down until it tightens on the gypsy or clutch nut retaining washer. When this happens the plunger pin 5 is forced back into the clutch nut

8 to allow the clutch nut to rotate and not over tighten. Once the clutch nut rotates past the pawl the plunger pin returns to its normal position.

The plunger pin 5 is allowed to move because of a spring 4 installed behind it. The spring allows the plunger pin to be pushed in when the clutch nut is under load allowing the clutch nut to rotate. Once the clutch nut has rotated past the pawl the spring pushes the plunger pin back to its normal position, this repeats itself once every revolution until the anchor winch is stopped or its direction changed .

The pawl 24 which is mounted to the chain cover/pawl housing 23 is mounted by a pivot point roll pin 25 to enable the pawl to be engaged for automatic downwards free fall or disengaged for conventional anchor winch operation. The pawl 24 is machined with various angles at the plunger pin 5 contact areas to allow it to have two functions. It holds the clutch nut in position to engage the gypsy and also, when the clutch nut is rotated in the opposite direction, it will disengage the gypsy allowing the anchor to free fall.

When the clutch nut 8 is to be engaged the anchor winch 100 is operated in lift mode, the plunger pin 5 then pushes against the top section of pawl 24 which has a 79 degree approach angle to the plunger pin which angle does not allow the plunger pin to depress. This holds the clutch nut 8 in position to be tightened.

As the clutch nut 8 tightens the plunger pin moves down the face of the pawl 24 and once the clutch nut is tightened the position on the pawl where the plunger pin now sits has been machined with a 23 degree approach angle which allows the plunger pin to depress very easily. The same angles have been used to disengage the clutch nut 8 and have been machined on the opposite side of the pawl. Although these angles are used in this preferred embodiment of the invention any appropriate angles which achieve the same effect may be used.

A clutch nut retaining washer 2 is bolted to the top of the main shaft 17 and acts to stop the clutch nut becoming undone when the anchor winch is in reverse or free fall. This washer 2 has a PVC wear washer 3 fitted to its underside to reduce friction between the clutch nut 8 and its retaining washer 2 and ensure that the clutch nut returns to its lifting position when the winch is in forward or lift mode.

Also provided are a ratchet pawl 15 and spring 14 to assist the anchor winch at the start of free fall at which time the weight of the anchor and rope/chain may be insufficient to effect free fall. For this reason the ratchet pawl 15 and spring 14 are fitted to the clutch cone 12 the clutch cone having a cavity machined on one side of its tapered surface which allows the ratchet pawl and spring to sit in the clutch cone but below the bearing area or tapered surface.

The tapered section of the gypsy 10 bore where the clutch cone 12 sits has a groove machined down one side of the tapered surface. This groove catches the front or

leading edge of the ratchet pawl creating a positive drive between the clutch cone and the gypsy.

This positive drive will only occur when the anchor winch is in reverse or free fall mode. This positive drive allows the anchor winch to pull chain up and out of the chain locker allowing the anchor to lower. Once the anchor and chain that has passed over the bow roller weighs more than the chain hanging down into the chain locker the anchor will begin to free fall. The ratchet pawl will then release itself from the groove in the gypsy acting like a ratchet in reverse.

The anchor winch of the invention therefore has the capacity to allow automatic lowering of an anchor to simulate continuous free fall or it may be used as a conventional winch by disengaging pawl 24. It may also be operated at the winch or remotely by a switching means.

Whilst we have described herein one specific embodiment of the invention it is to be understood that variations and modifications in this can be made without departing from the spirit and scope thereof.

The claims defining the invention are as follows:

1. A winch which is provided with means to automatically provide free fall of an anchor, said winch including means to drive the anchor's attached rope/chain out of a storage area until the weight of the anchor and attached rope/chain is sufficient to activate a means to disengage the drive mechanism such that the anchor is permitted to free fall; the winch also having means to provide controlled motorised lowering and braking of the falling anchor at any time during its downwards fall but which may also be used as a conventional power up power down winch.
2. A winch as claimed in claim 1 wherein the means for automatically providing free fall for a winch is provided by a pawl which can be disengaged for conventional motorised winch operation.
3. A winch as claimed in claim 3 having a drive shaft with a clutch cone keyed to it, which clutch cone provides close engagement with a rope/chain gypsy within a bore in the gypsy.
4. A winch as claimed in claim 3 wherein the gypsy is able to rotate freely on the drive shaft.
5. A winch as claimed in claim 4 having a clutch nut held in position against the pawl by a spring and loaded plunger pin when the drive shaft is driven in a lifting

direction and which clutch nut is driven down the shaft and tightens with respect to the clutch cone causing the gypsy to rotate in the same direction as the shaft.

6. A winch as claimed in claim 6 wherein rotation of the drive shaft in an opposite direction causes the plunger pin to be held against the pawl thereby forcing the clutch nut to loosen and be driven up the drive shaft and cause the gypsy to be released and operate in free fall mode.
7. A winch as claimed in claim 5 or claim 6 wherein the spring allows the plunger pin, which is fitted to the outside diameter of the clutch nut, to be pushed in relative to the clutch nut when the clutch nut is under load allowing the clutch nut to rotate so that, once the clutch nut has passed the pawl the spring pushes the plunger out again.
8. A winch as claimed in claim 7 wherein a top section of the pawl has an approach angle to the plunger when in lift mode which does not allow the plunger to depress.
9. A winch as claimed in claim 8 wherein, as the clutch nut tightens and the plunger moves down the pawl, when the clutch nut has tightened the approach angle of the pawl permits the plunger to be easily depressed.

10. A winch as claimed in any preceding claim in which means are provided to create positive drive between the gypsy and the clutch cone which positive drive only occurs when the winch is in reverse or free fall mode.
11. A winch as claimed in claim 10 wherein the positive drive means is effected by the engagement of a ratchet pawl on the clutch cone with a groove in the gypsy bore.
12. A winch as claimed in claim 11 whereby the positive drive allows the winch to pull rope and/or chain from a locker until the weight of the anchor and rope and/or chain passed out of the locker exceeds the weight of that within it and causes the anchor to free fall and the ratchet pawl to be released.
13. A winch substantially as herein described with reference to the accompanying drawings.

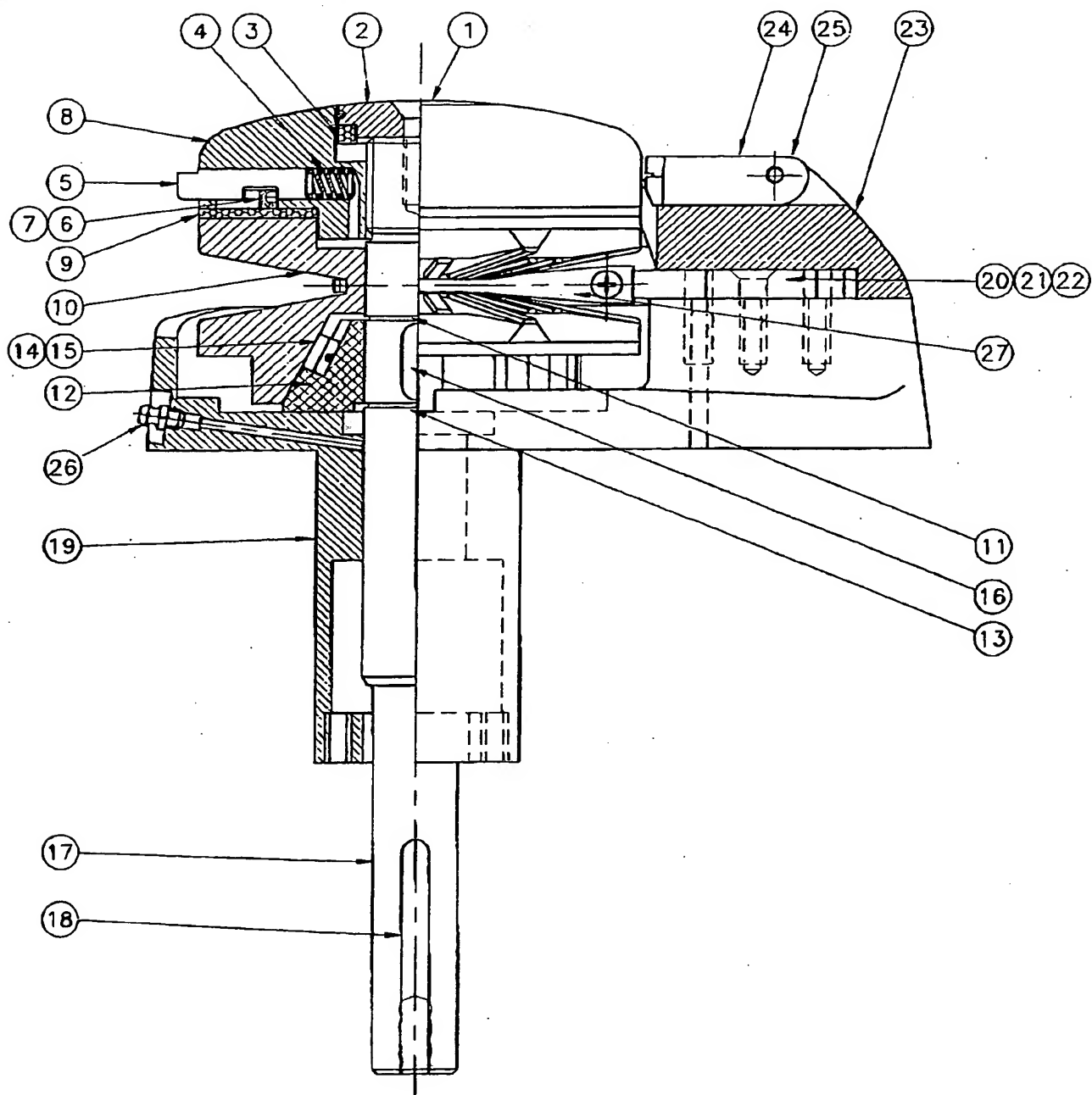


Fig 1

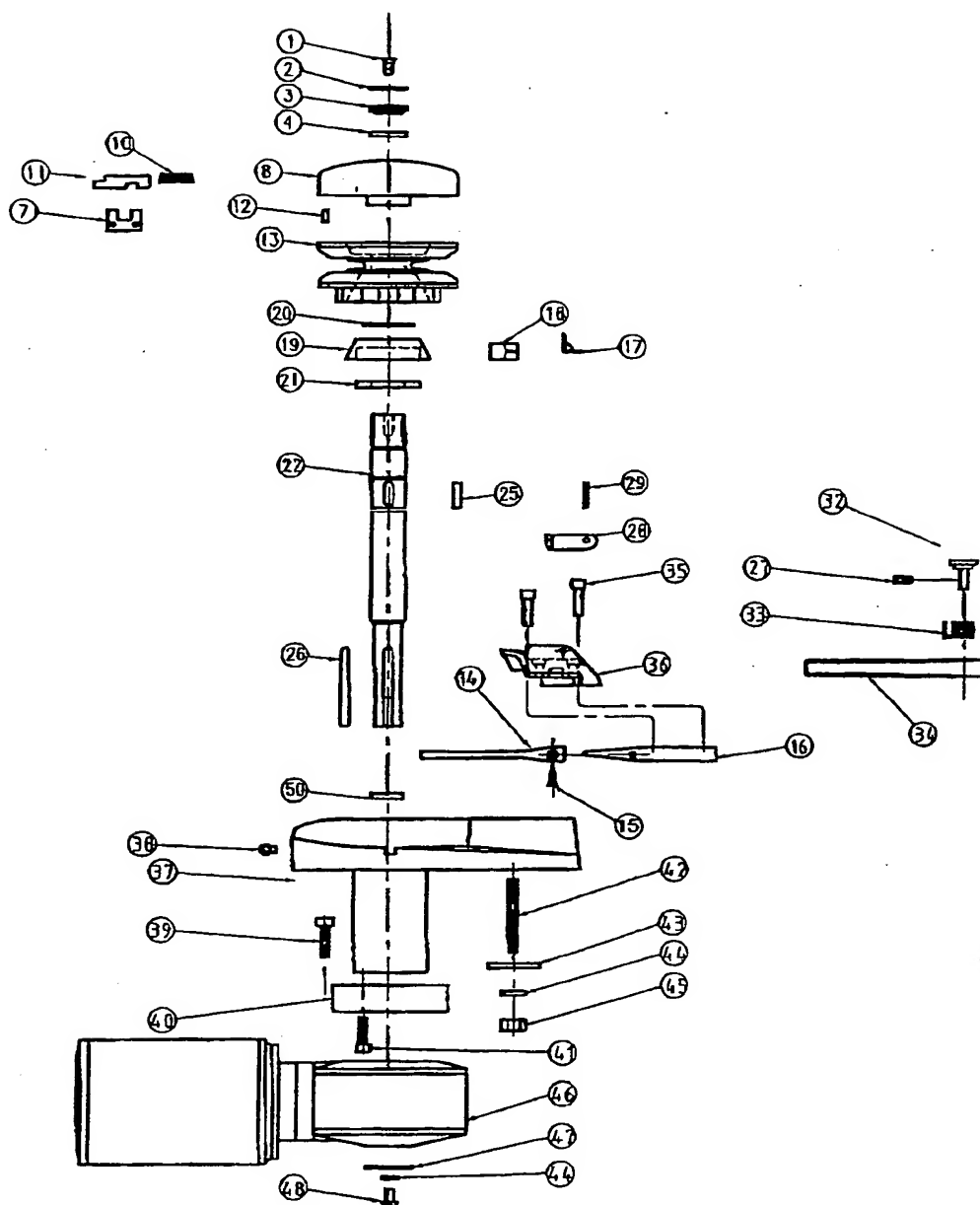


Fig 2.

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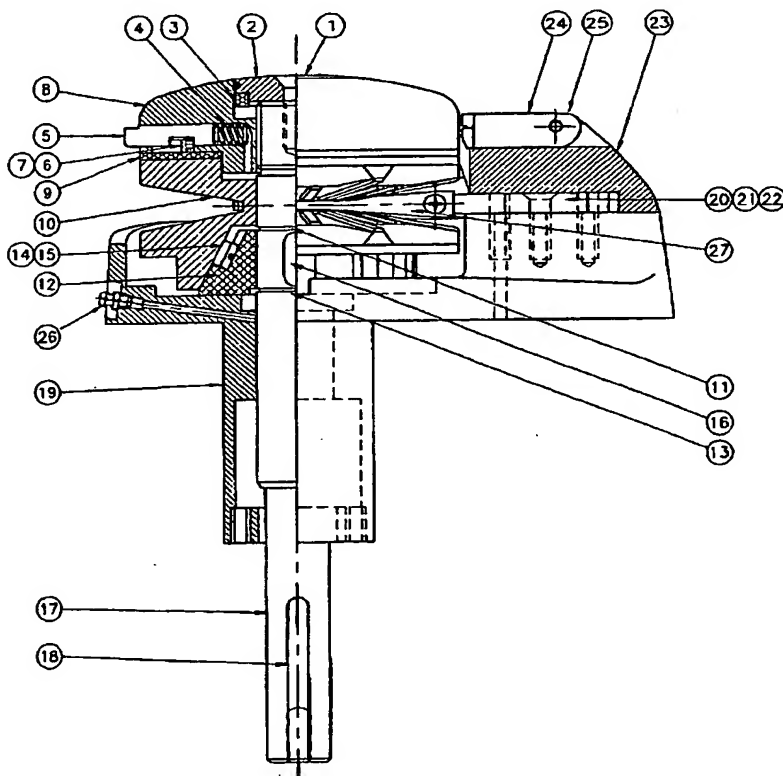
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- (71) Applicant (for all designated States except US): **MUIR ENGINEERING PTY. LIMITED** [AU/AU]; 100 Browns Road, Kingston, TAS 7050 (AU).
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[Continued on next page]

(54) Title: **FREE FALL WINDLASSES**



(57) Abstract: A winch 100 which is provided with means to automatically provide free fall of an anchor, said winch including means to drive the anchor's attached rope/chain out of a storage area until the weight of the anchor and attached rope/chain is sufficient to activate a means to disengage the drive mechanism and the anchor is permitted to free fall; the winch also has means to provide controlled motorised lowering and braking of the falling anchor at any time during its downwards fall but which may be used as a conventional power up power down winch.

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A. CLASSIFICATION OF SUBJECT MATTER					
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According to International Patent Classification (IPC) or to both national classification and IPC					
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Minimum documentation searched (classification system followed by classification symbols) IPC B 66 D 001/40, 001/42, 001/72, 005/02					
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU: IPC as above					
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)					
C. DOCUMENTS CONSIDERED TO BE RELEVANT					
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.			
A	Derwent Abstract Accession No. 97-521755/48, class X 25, JP 09249391-A (NAKATE) 22 September 1997				
A	Abstract & Figure DE 4446443-A (FUERSTLICH HOHENZOUERNSCHE WERKE LAUCHERTHAL) 27 JUNE 1996.				
A	Abstract & Figure				
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;"> <input type="checkbox"/> Further documents are listed in the continuation of Box C </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> See patent family annex </div> </div>					
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; vertical-align: top;"> <p>* Special categories of cited documents:</p> <p>"A" Document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 30%; vertical-align: top;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p> </td> <td style="width: 40%;"></td> </tr> </table>			<p>* Special categories of cited documents:</p> <p>"A" Document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p>	
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Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No.: (02) 6285 3929		Authorized officer BANDULA RAJAPAKSE Telephone No.: (02) 6283 2120			

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Patent Document Cited in Search Report	Patent Family Member
	NONE
END OF ANNEX	